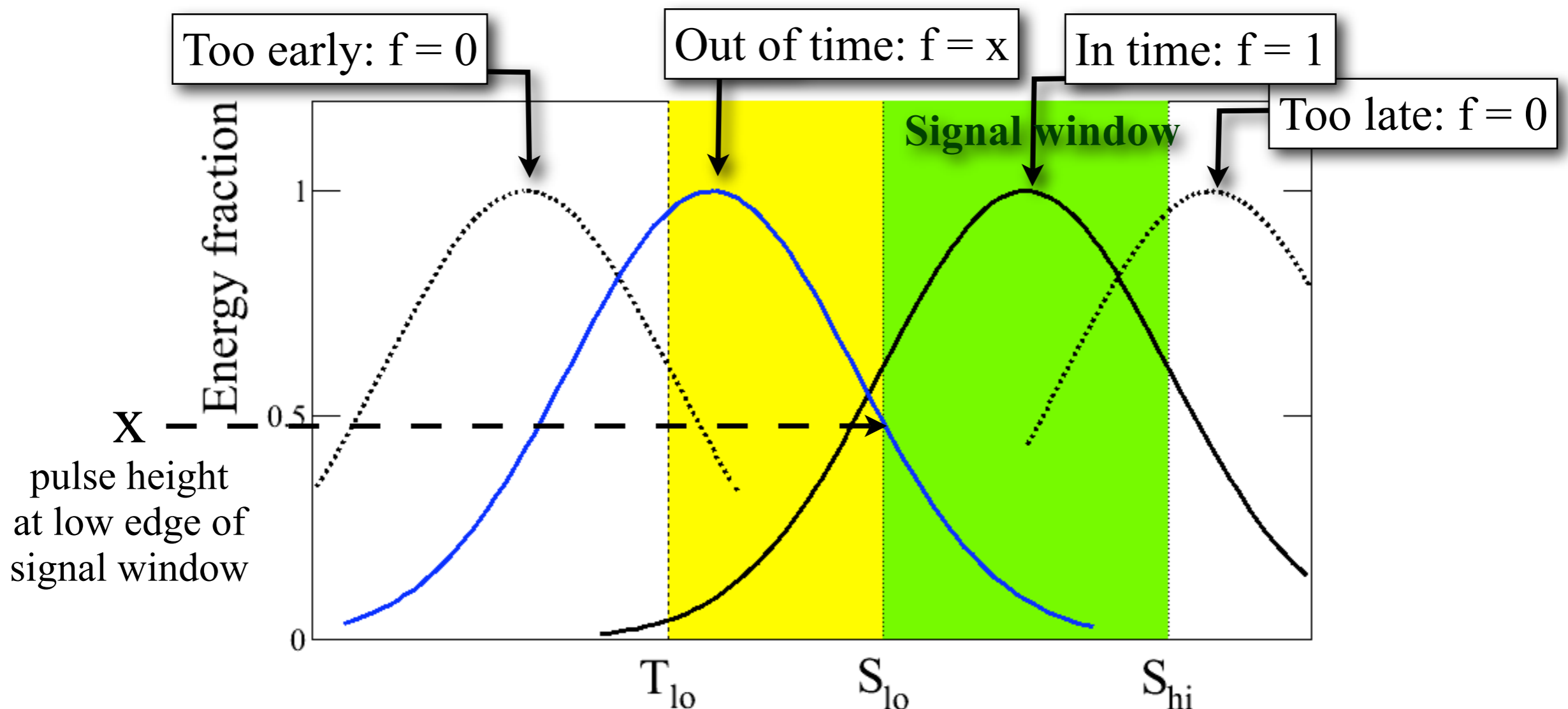


EMC Waveform and Timing Window in Fastsim

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Current waveform modeling

- Babar EMC signal is sampled every 270ns.
- A maximum is found in the signal window and a fit to it and its two neighbors is performed to determine time and pulse height, which is converted to energy.
- Waveform is modeled by a gaussian of mean t_0 (simhit time) and σ .
- The energy used to create fastsim cluster depends on the time.

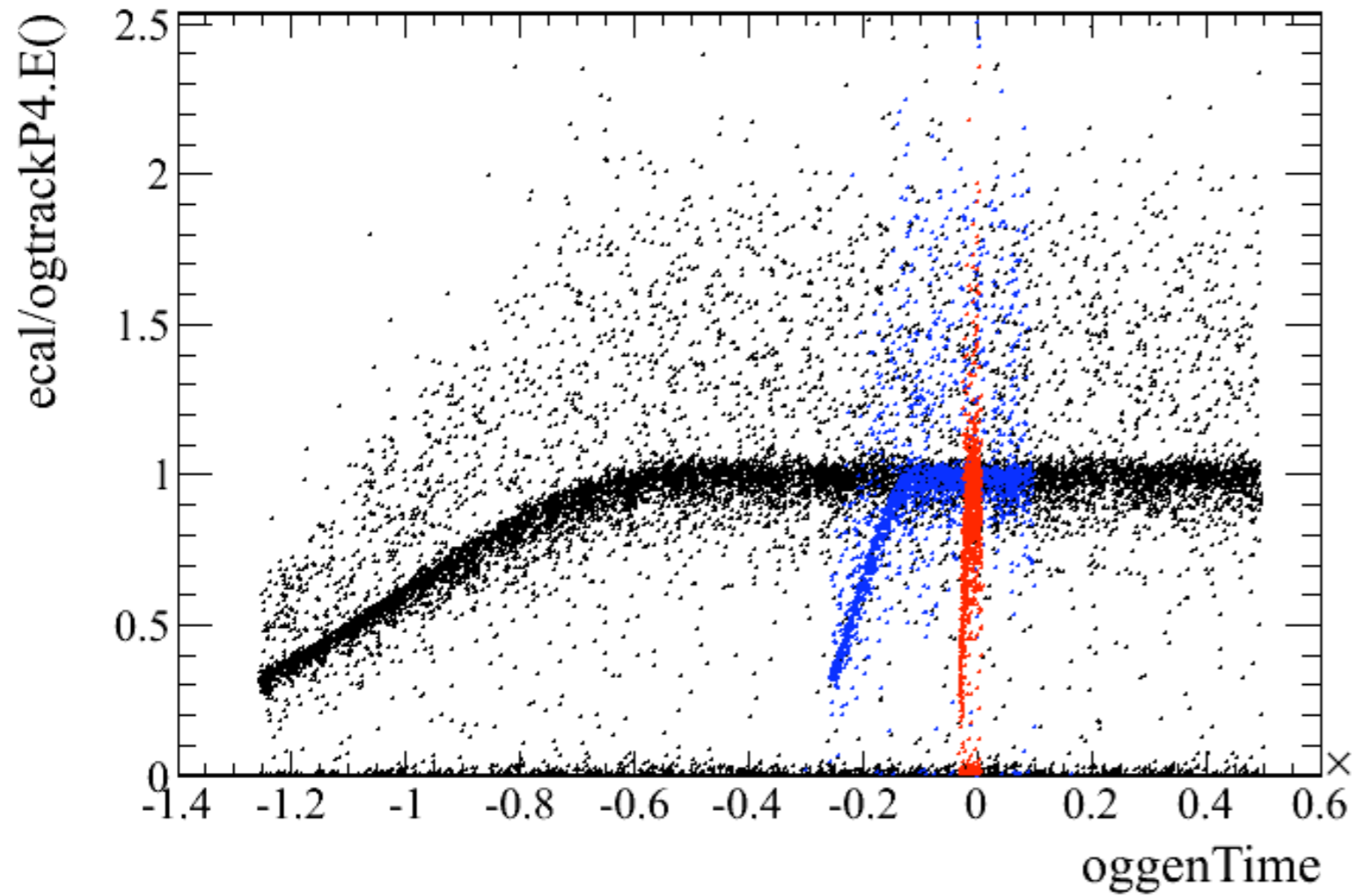


Current fastsim parameters

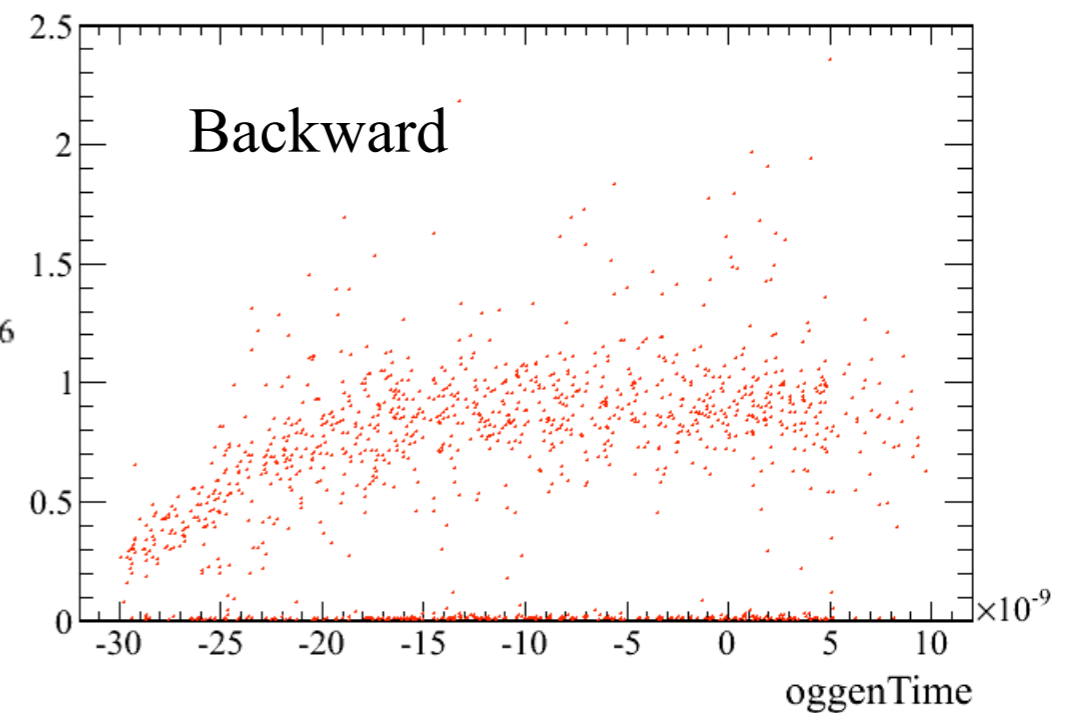
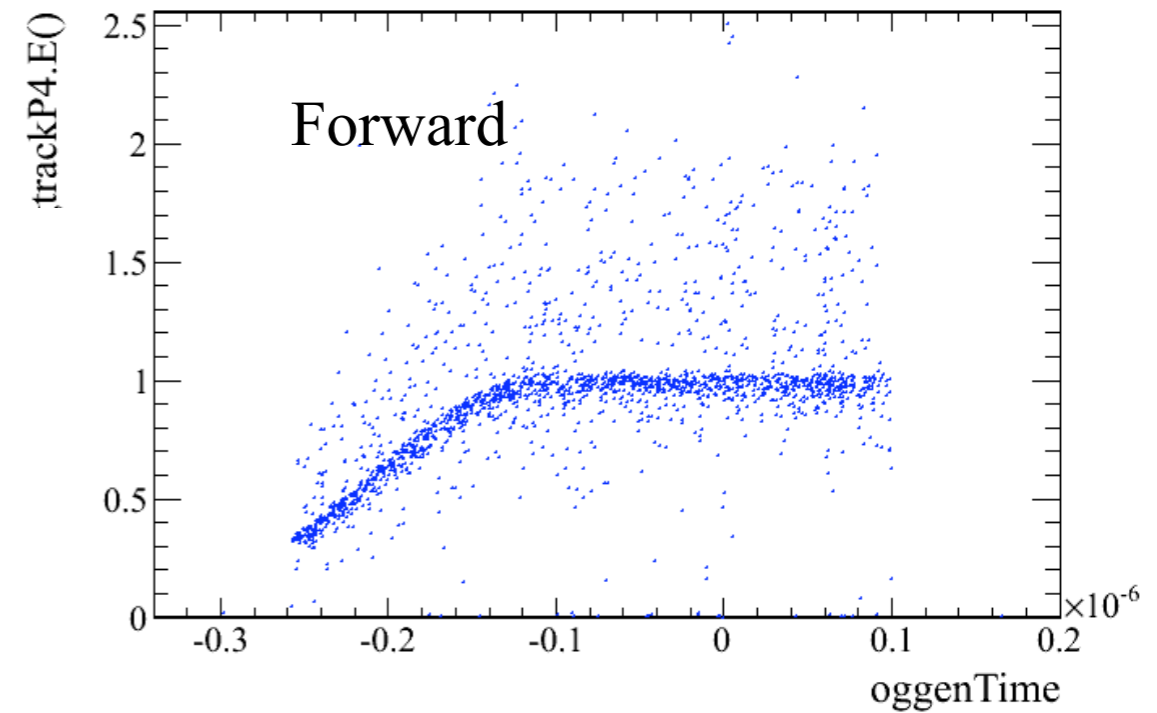
- Assume we cannot remove background if it is within 1.5σ below the signal window, but can remove it completely if it happens earlier than that.
 - ▶ Reality is probably somewhat in between. We don't know.
 - ▶ These parameters are used in February production.

unit = ns	Fwd	Barrel	Bwd	
σ	100	500	10	
S_hi	100	500	10	$+1\sigma$
S_lo	-100	-500	-10	-1σ
T_lo	-250	-1250	-25	-2.5σ

Energy fraction vs. particle gen. time



neutrino events with bkg mixed



Problems with this model

- Babar records all digis within $\pm 1\mu\text{s}$ of trigger in raw data. An energy-weighted time t_0 over all EMC digis is calculated. During reconstruction, digis outside $t_0 \pm 120\text{ns}$ are removed. (Sometimes an out-of-time Bhabha dominates the EMC and the EMC info of the entire physics event is thrown out.)
- Current signal window of $\pm 500\text{ns}$ plus additional 750ns below the signal window is clearly too wide.
- Gaussian waveform is not realistic. May need to use more realistic model considering scintillator light decay time, shaping time, or perhaps even sampling time.
- May need to consider better way to add energy of different times.